



Health Services
LOS ANGELES COUNTY

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February 3, 2009

TO: Each Supervisor

FROM: John F. Schunhoff, Ph.D. 
Interim Director

SUBJECT: **EMERGENCY GENERATOR FAILURE INVESTIGATION
REPORT OLIVE VIEW-UCLA MEDICAL CENTER**

On November 18, 2008, on motion by Supervisor Antonovich, your Board directed the Chief Executive Officer, the Director of Internal Services (ISD), the Interim Director of Health Services (DHS), and Fire Chief to consult with the Department of Public Works (DPW) to hire an appropriate consultant to participate in the root cause analysis of the emergency generators and the fuel pump system failure at Olive View-UCLA Medical Center and report back to the Board.

Beginning on November 20, 2008, DPW and electrical/mechanical consulting engineers (Power Engineering Services and Facility Dynamics Engineering) conducted field investigations by interviewing the central plant personnel, reviewing logs/reports, and testing the emergency generators, fuel pump system, and fuel tanks. The engineers completed their report on December 16, 2008. See attachment for the consultant's executive report.

It was found that the emergency generators shut down because fuel was not replenished into the fuel tanks that supply the generators. The control circuit for the fuel pumps is connected to the cogeneration plant, and when the cogeneration plant is shut down, the power must be switched manually to the emergency generators in order to resume pumping fuel into the system. During the fire, the fuel pumps and control circuit operated as installed. However, neither ISD or the hospital had plant operating procedures that addressed a scenario where both Department of Water and Power (DWP) and cogeneration power would be interrupted simultaneously, and, therefore, the need to manually switch the fuel pump to the emergency generator power was not known to plant operators.

The engineers recommended the following six steps be taken to assure that this type of failure does not occur in the future.

1. DHS and ISD to provide a written interim operating procedure to assure proper operation of the emergency fuel supply to the generators based on the result of the findings. **Status – Complete.**

2. DPW to prepare a design and implement an automated connection of the fuel pumps to an emergency power source that will function whenever there is future interruption to the DWP power source. **Status – Underway. Scheduled to be completed by December 2009.**
3. DHS to implement a means to manually transfer fuel from the storage tanks into the fuel tanks in the event the electric fuel transfer system fails. **Status – Underway. Scheduled to be completed by March 2009.**
4. DHS to inspect and clean all interiors of the electrical switchgear and control panels in the plant of smoke/ashes that entered the system and replace all air filters. **Status – Underway. Scheduled to be completed by April 2009.**
5. DPW to conduct a comprehensive evaluation of the cogeneration plant and emergency generator system operations and procedures manual. **Status – Underway. Scheduled to be completed by June 2009.**
6. DPW to evaluate all electrical loads and identify those that are life-safety, critical, or required by code and assure they are properly connected to the automatic transfer switches and emergency generators. **Status – Underway. Scheduled to be completed by September 2009.**

The total cost of implementing these recommendations is approximately \$185,000 which will be funded from the DHS operating budget. Not included in the estimated budget is the cost to implement possible recommendations resulting from the evaluation as outlined in #6 above.

In addition to these recommendations, the engineers also provided a number of additional recommendations to further increase the reliability of the power supply to the hospital. DHS, ISD, and CEO will evaluate these recommendations and submit them as part of the budget process.

If you have any questions regarding this matter, please let me know.

JFS:jds
R/Projects/OVMC/OVMCFire/BD Memo 090127

Attachment

c: Chief Executive Officer
Executive Officer, Board of Supervisors
County Counsel
Director of Public Works
Director of Internal Services

EXECUTIVE REPORT

DATE: December 16, 2008
SUBJECT: Olive View-UCLA Medical Center, Sylmar, California
Sylmar Fire 480V Emergency Generator Shutdown Investigation
PREPARED BY: Doug Effenberger, P.E.
Power Engineering Services, Inc.



Tony Pierce, P.E.
Facility Dynamics Engineering



Incident

On the night of November 14 and early morning hours of November 15, 2008, the Olive View-UCLA Medical Center was subjected to a natural disaster when a fire storm, driven by fierce Santa Ana winds, swept through the facility destroying structures and causing a utility (DWP) power outage at forty-five minutes after midnight. The utility power outage caused the hospital to rely on both the facility cogeneration gas turbine generators and 480V emergency generators to supply all power.

At the time of the outage the staff present were monitoring the equipment. All personnel were wearing breathing apparatus due to the fire smoke that had entered the plant. Visibility was poor. At approximately 1:09 am, the main gas turbine power generators were shut down by a combustible gas sensor safety device, as designed. The sensitive safety device operated as a result of the thick smoke and airborne ash in the air that spread throughout the plant.

At approximately 1:45 am, the 480Volt (V) emergency diesel generators that were supplying power to life safety and critical loads shut down resulting in a complete power outage throughout the hospital. The 480V emergency generators were restarted at 4:10 am. The cogeneration gas turbines were restarted at 5:00 am and DWP power was restored at 5:15 am.

Findings

A site investigation has been conducted to determine the cause of the 480V emergency generator shutdown. This review included meetings with both the ISD cogeneration Plant operators and the hospital staff who maintain the emergency generator system, as well as inspecting and conducting circuit tracing of the equipment and performing a series of tests and measurements.

The generators were originally installed as part of the complete new central plant for the new hospital in 1984. After inspection, circuit tracing and by conducting a series of tests and measurements, it has been determined that the fuel oil pumps lost the control signal and shut down during the fire, which then caused the generators to shut down due to a lack of fuel. It has been confirmed that the power to the fuel pumps is supplied by the emergency generators, and the control circuit for the pumps is supplied from a panel that is connected to the cogeneration plant electrical system. The power for the control circuit was lost when the gas turbine generators shut down due to the gas detector and alarm, which caused the fuel pumps to stop operating. After approximately 30 minutes, the emergency generator day tanks, which are filled by the fuel pumps, ran dry and the generators shut down due to lack of fuel.

The fuel pumps and the control circuit operated as installed, however, the existing emergency generator and cogeneration plant operating procedures did not cover this particular set of circumstances that would have prevented the incident. Now that the condition is known, corrective interim measures have been taken to prevent a reoccurrence.

Interim Measures

Both ISD and hospital staff have been briefed by the investigative team on the cause of the emergency generator fuel system failure. As a result, the hospital and ISD Staff have written an interim operating procedure for securing the 120V control power source and monitoring the fuel supply system and emergency generator operation whenever the 480V generators are running. In order to prevent a reoccurrence of the 480V emergency fuel system failure experienced on November 15, 2008 it is essential that the fuel pump 120V control power circuit be connected to a circuit supplied by the 480V emergency generator. It is also essential to provide a means for manual transfer of fuel into the emergency generator day tanks in the event the fuel pumps cease operation for any reason.

Recommendations

The following recommended actions have been identified in response to the incident. These recommendations are provided in three distinct groups. The Essential Measures are those deemed critical to prevent a similar potential outage in the future. Several of these measures have already been enacted by the hospital staff and are in place today. The Recommended measures have been provided to identify areas where failure did not occur during this event, but were discovered during the investigation as timely issues that will benefit the hospital. The Consideration measures will enhance performance of the plant's overall electrical system.

Essential Measures

- DHS and ISD have written an interim operating procedure to assure proper operation of the 480V emergency generator fuel supply while the generators are running.
- DHS has implemented a means for manually transferring fuel into the generator day tanks in the event the electric fuel transfer system fails.
- Prepare a design for review and implementation to connect the fuel pump 120V control circuit to an emergency source. Connect the 120V control circuit once the design is approved.
- Inspect and clean the interiors of the electrical switchgear and control panels in the plant and replace all air filters.
- Conduct a comprehensive evaluation of the cogeneration plant and 480V Emergency Generator Operations and Procedures Manual
- Evaluate all electric loads and identify those that are life safety, critical or required by Code and assure they are connected to the automatic transfer switches and 480V emergency generators.

Recommended

- The fuel oil system should be inspected and reviewed to determine improvements that will enhance reliability. Improvements could include the installation of a monitoring, control and alarm system, level and flow sensors, fail safe valves, duplex pump configuration, remote status indication and alarms.
- Evaluate the automation of the existing manual fuel source selection valves for the main underground storage tanks used to supply the plant fuel oil system.
- Establish a single manager for fuel system maintenance and operation.

EXECUTIVE REPORT

Sylmar Fire-480V Emergency Generator

Shutdown Investigation

December 16, 2008

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- Install a fuel return line and fuel oil cooler to return unburned fuel to the generator day tanks will extend the generator run time in the event of a fuel supply failure.
 - Meet with LADWP representatives to discuss options available to improve the reliability and power quality of the DWP service to the hospital.
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Consideration

- Perform a comprehensive audit of the 24 year old cogeneration plant and 480V emergency generator system. The audit should include inspection, update of all facility drawings and documentation, review of design, system studies, assessment of the existing condition and assessment for continued use of the equipment. Identify wiring, components and equipment for removal that are no longer in service or necessary for operation. Prepare a report with recommendations that are based on the audit. The recommendations should address system design, reliability, capacity, control, instrumentation, operation, maintenance, and related issues. Provide a cost estimate for the measures recommended in the report.